

## DESCRIPTION

## UNIVERSAL JOINT BOOT

## TECHNICAL FIELD

[0001]

The present invention relates to a boot for protecting a movable mechanism and, in particular, to a universal joint boot for protecting the movable mechanism of a universal joint in automobiles and industrial machines.

## BACKGROUND ART

[0002]

Among conventional boots of this kind is a boot that includes a freely extendable and contractible bellows part, a large-diameter annular mounting part formed at one end in the axial direction of this bellows part, and a small-diameter annular mounting part formed at the other end in the axial direction, and is molded by blowing material such as thermoplastic elastomer.

[0003]

In the boot of this kind, the large-diameter side mounting part is fixedly fastened by one clamp to the outer peripheral surface of an end portion of one shaft of two members that can move relatively to each other and the small-diameter side mounting part is fixedly

fastened by another clamp to the outer peripheral surface of the other shaft.

[0004]

With this, the bellows part can be flexibly deformed with the relative movement of the two members to prevent foreign matters from entering a movable mechanism between the two members from the outside and to prevent lubricating grease or the like filled in the movable mechanism from leaking to the outside.

[0005]

As for the boot described above, there has been known a boot that is used for protecting a constant-velocity joint used for transmitting a driving force in an automobile. Further, there is a case where the outer peripheral shape of the fixed part of a joint cup having the boot mounted thereon is not cylindrical but may be formed in the shape of a deformed cylinder that has three curved depressions, so-called tripod. In this case, in the conventional boot, the inner periphery of the fixing part of the boot is formed in the shape of a tripod according to the shape of the outer periphery of the fixing part of the cup and the outer periphery of the fixing part of the boot is formed in a cylindrical shape. The outer periphery of the fixing part of the boot is fastened by a band, whereby the boot is fixed to the cup.

[0006]

Further, a construction has been proposed in which,

when both of the boot and the cup are made of hard materials, an adaptor member made of rubber or elastic plastic that is soft and can be easily deformed is interposed between the boot and the cup so as to eliminate the gap between the respective members at the fixing part (see, for example, patent document 1). To be specific, as shown in FIG. 10, to mount a boot 101 on a case (not shown) formed in the shape of a tripod, an adaptor member 110 having a circular outer peripheral surface 111 and an inner peripheral surface 113 having convex portions 112 corresponding to the shape of a tripod of the outer periphery of the fixing part of the case is made separately from the boot 101 main body. Then, the adaptor 110 is fitted in the boot 101 and is further mounted on the case to cover and protect the movable mechanism of a constant-velocity joint.

[0007]

Further, a construction has been proposed in which an annular rubber bush 130 is mounted on the opening end edge 122 of a hollow cylindrical boot body 128 made of synthetic resin as a dust preventing boot of constant-velocity joint (see, for example, patent document 2). The rubber bush 130 is formed in the shape of a letter C in section and the opening end edge 122 is closely fitted in the center depressed groove 132. The rubber bush 130 is pressed onto the outer peripheral surface 116 of the case by a fastening band 134 mounted

on the outer peripheral surface of the rubber bush 130. Here, FIG. 11A is a sectional view of a dust preventing boot 126 and FIG. 11B is an enlarged sectional view of a portion enclosed by a dotted line in FIG. 11A.

[0008]

Patent document 1: U.S. Patent No. 6402999

Patent document 2: Japanese published unexamined utility model application No. 60-64362

#### DISCLOSURE OF THE INVENTION

Problems to be solved by the invention

[0009]

However, the related art described above presents the following problems.

[0010]

That is, the boot body and the adaptor are made separately and then are assembled together, which presents a problem of productivity. In particular, in recent years, when light resin is used for the material of a boot so as to reduce the weight of a tripod type constant-velocity joint, there is also presented a problem that the boot resists being deformed and hence can not be put into close contact with an adaptor.

[0011]

The present invention has been made to solve the problems of the related art described above. The object of the invention is to provide a universal joint boot

that can be easily assembled.

#### Means for Solving the Problems

[0012]

To achieve above-mentioned object, the present invention provides a universal joint boot comprising:

a boot body including a cylindrical bellows part that has valleys and peaks formed continuously in a repetitive manner and can extend and contract and an opening portion which is formed in one end of the bellows part and into which a case for receiving one member of two members moving relatively to each other is inserted; and

an annular adaptor that is mounted on an inner peripheral surface of the opening portion and has an outer peripheral surface formed nearly in the same shape as the inner peripheral surface,

characterized in that the adaptor has:

a fixing portion that is pressed by the inner peripheral surface of the opening portion of the boot body, thereby being fixed to the case;

a reversing portion that is located opposite to the fixing portion with the opening portion between them and sandwiches the opening portion together with the fixing portion; and

a folding portion where the reversing portion is folded back outside.

[0013]

According to this construction, the adaptor is mounted on the boot body and then can sandwich the opening portion of the boot body, so that even if the boot body is made of material that resists being deformed, the boot body can be easily assembled.

[0014]

Further, the universal joint boot is characterized in that the reversing portion has a protruding portion for pressing the outer peripheral portion of the opening portion inwardly.

[0015]

According to this construction, the adaptor can sandwich the boot body more securely and hence can enhance sealing ability.

[0016]

Further, the universal joint boot is characterized in that the outer periphery of the fixing portion has an uneven surface in contact with the inner periphery of the boot body.

[0017]

According to this construction, the boot body resists being removed from the adaptor.

[0018]

Still further, the universal joint boot is characterized in that a cutout is formed from the reversing portion to the folding portion.

[0019]

According to this construction, even if the adaptor is hard, the reversing portion can be easily folded back and hence can enhance ease with which the boot is assembled.

[0020]

Still further, the universal joint boot is characterized in that the reversing portion has a mounting portion on which a band is mounted in a state where the reversing portion is folded back from the folding portion.

[0021]

According to this construction, it is possible to seal not only the fixing portion and the boot body but also the boot body and the reversing portion and hence to enhance sealing ability.

#### Advantageous effect of the invention

[0022]

According to the invention, it is possible to provide a universal joint boot that can be easily assembled.

#### BEST MODE FOR CARRYING OUT THE INVENTION

[0023]

Hereafter, the best mode for carrying out this invention will be described in detail by way of example

with reference to the drawings and embodiments. However, as for the size, material, shape, and relative arrangement of constituent parts described in these embodiments, it is not intended to limit the scope of this invention only to these unless otherwise specified. Further, the materials and shapes of members once described in the following description are the same as those described in the beginning unless otherwise specified.

[0024]

First, a universal joint boot according to this embodiment will be described with reference to FIG. 2. FIG. 2 is an external perspective view showing a state where a boot according to this embodiment is mounted on a case.

[0025]

A universal joint boot 10 used for a constant-velocity universal joint according to this embodiment has a boot body 1 and an annular adaptor 20 mounted on the boot body 1. The boot body 1 has a cylindrical bellows part that has peaks and valleys formed continuously in a repetitive manner and can extend and contract and an opening portion 2 which is formed at one end of the bellows part and into which a case for receiving one member of two members moving relatively to each other is inserted. Further, the annular adaptor 20 is mounted on the inner peripheral surface of the



opening portion 2 of the boot body 1 and has an outer peripheral surface formed in the same shape as the inner peripheral surface. That is, the universal joint boot 10 is fitted on the outer periphery of the opening portion of a joint cup (case) 40 that receives the shaft part of one of the two members capable of moving relatively to each other and is fixed to the cup 40 by a band 30 in a state where the adaptor 20 is mounted on the boot body 1.

#### EMBODIMENT 1

[0026]

FIG. 1 is a schematic construction view of a universal joint boot according to embodiment 1 and FIG. 3 is a half-sectional view of an adaptor according to the embodiment 1.

[0027]

As shown in FIGs. 1 and 3, the adaptor 20 is an annular member having an outer peripheral surface 21 formed in a circular shape and an inner peripheral surface 22 formed in the shape of a variant (tripod) having three curved protrusions 23. Here, the adaptor 20 according to this embodiment is formed of rubber or elastic plastic. More preferably, it is recommendable to select rubber or synthetic resin suitable for molding.

[0028]

The adaptor 20 is first manufactured as a hollow

cylindrical member, for example, by molding (see FIG. 3). The adaptor 20 as the cylindrical member has a fixing portion 24 fixed to the boot body 1 by the band 30, a folding portion 25 having a thinner thickness than the fixing part 24 so as to be easily folded back, and a reversing portion 26 that is folded back and then sandwiches one opening portion 2 of the boot body 1.

[0029]

Next, the adaptor 20 is inserted to a predetermined position from the one opening portion 2 of the boot body 1 and then the folding portion 25 is folded back to the outside so as to sandwich the opening portion 2. With this, the boot body 1 is securely sandwiched by the adaptor 20 to enhance sealing ability. Further, because the adaptor 20 is mounted on the boot body 1 and then sandwiches the opening portion 2 of the boot body 1, even if the boot body 1 is made of material that resists being deformed, the boot body 1 can be easily assembled.

[0030]

Further, the reversing portion 26 has a protruding portion 26a so as to press the outer peripheral surface of the edge of the opening portion 2. The protruding portion 26a is formed so as to protrude toward the inside of the adaptor 20 in a state where the reversing portion 26 is folded back at the folding portion 25. With this, the adaptor 20 can sandwich the boot body 1 more securely and hence can enhance sealing ability.

[0031]

Still further, when the adaptor 20 is made of material that is so hard that resists being deformed, cutouts 27 may be formed from the reversing portion 26 to the folding portion 25 (see FIG. 4). With this, even if the adaptor 20 is hard, the reversing portion 26 is easily folded back to enhance ease with which the boot body 1 is assembled. Here, the number of cutouts 27 can be selected as appropriate by the material, size, and thickness of the adaptor 20 and the cutouts 27 are preferably formed at equal intervals. With this, the adaptor 20 can sandwich the opening portion 2 of the boot body 1 uniformly in a state where the reversing portion 26 is folded back.

[0032]

Still further, an uneven surface 24a may be formed on the outer periphery of the fixing portion 24 (see FIG. 5). With this, the boot body 1 becomes resistant to being removed from the adaptor 20 and is securely fixed to the cup 40 by the band 30.

## EMBODIMENT 2

[0033]

FIG. 6 is a schematic construction view of a universal joint boot according to embodiment 2 and FIG. 7 is a half-sectional view of an adaptor according to embodiment 2. Here, the description of construction

different from that of the embodiment 1 described above will be mainly provided below and the description of the other construction will omitted as appropriate.

[0034]

The adaptor 20 according to the embodiment 2 has the fixing portion 24 fixed to the boot body 1 by the band 30, the folding portion 25 having a thinner thickness than the fixing part 24 so as to be easily folded back, and the reversing portion 26 that is folded back and then sandwiches one opening portion 2 of the boot body 1.

[0035]

Here, the reversing portion 26 is extended to a position opposite to the outer periphery of the fixing portion 24 in a state where it is folded back from the folding portion 25. The reversing portion 26 has a mounting portion 26b where the band 30 is mounted. The mounting portion 26b is formed on the outer periphery of the reversing portion 26 in a state where the reversing portion 26 is folded back at the folding portion 25. Further, the mounting portion 26b, a portion of the reversing portion 26, is depressed along the entire periphery so that the band 30 is not shifted in a mounting position.

[0036]

As described above, the opening portion 2 of the boot body 1 is sandwiched by the fixing portion 24 and the reversing portion 26 and then the band 30 is mounted

on the mounting portion 26b to seal not only the fixing portion 24 and the boot but also the boot body 1 and the reversing portion 26, which can further enhance sealing ability.

[0037]

Further, an uneven surface may be formed on the outer periphery of the fixing portion 24 (see FIG. 8). With this, the boot body 1 becomes resistant to being removed from the adaptor 20 and hence the boot body 1 is securely fixed to the cup 40 by the band 30.

[0038]

Still further, when the adaptor 20 is manufactured, the reversing portion 26 does not necessarily need to be straight with respect to the fixing portion but, as shown in FIG. 9, may be gradually increased in inside diameter toward the tip of the reversing portion 26. With this, the reversing portion 26 can be easily folded back and hence it is possible to provide a universal joint boot that can be easily assembled..

#### BRIEF DESCRIPTION OF THE DRAWINGS

[0039]

FIG. 1 is a schematic construction view of a universal joint boot according to embodiment 1.

FIG. 2 is an external perspective view showing a state where a boot according to this embodiment is mounted on a case.

FIG. 3 is a half-sectional view of an adaptor according to embodiment 1.

FIG. 4 is a half-sectional view of the adaptor according to embodiment 1.

FIG. 5 is a half-sectional view of the adaptor according to embodiment 1.

FIG. 6 is a schematic construction view of a universal joint boot according to embodiment 2.

FIG. 7 is a half-sectional view of an adaptor according to embodiment 2.

FIG. 8 is a half-sectional view of the adaptor according to embodiment 2.

FIG. 9 is a half-sectional view of the adaptor according to embodiment 2.

FIG. 10 is an external perspective view of a boot for protecting a constant-velocity joint in the related art.

FIG. 11 is a sectional view of a dust-protecting boot in the related art.

#### EXPLANATIONS OF LETTERS OR NUMERALS

[0040]

1 boot body

2 opening portion

10 universal joint boot

20 adaptor

21 outer peripheral surface

22 opening end edge  
22 inner peripheral surface  
23 protrusion  
24 fixing portion  
24a uneven surface  
25 folding portion  
26 reversing portion  
26a protruding portion  
26b mounting portion  
30 band  
40 joint cup (case)